



Job Title: NCP South Plot Project	DIC Job No.: 070035
Owner: SPC (Saudi Polymers Company)	Doc. No.: VP-2800-229-001-42/43/44V60-143
P/O NO.: 070035-2800-229-001-A01	Item No.: 42/43/44V60 (42/43E95 & 44E98)
P/O Description: INRU/PNRU Package	

INRU/PNRU COMPRESSOR SYSTEM OIL COOLER CALCULATIONS (KEC)

Job No.:	070035
	A - Approved
	AAN - Approved As Noted
	RFC - Return for Correction
	NA - Not Applicable
Signed By:	Date:
Daelim permission to proceed or review taken on vendor prints shall not relieve vendor from its responsibilities or liabilities under the purchase order	

Total 38 Pages

2	02-16-10	Final	AB	AB	AB
1	07-09-09	Revise oil cooler datasheet and DWP	AB	AB	AB
0	02-25-09	For Approval	AB	AB	AB
REV.	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED



KOBELCO EDTI COMPRESSORS, INC.

204B N. Smith Avenue
Corona, California 92880, USA

CUSTOMER
MTR**HEAT EXCHANGER DESCRIPTION**

INRU COMP. LUBE OIL COOLER
PNRU COMP. LUBE OIL COOLER
18-192-BEU-2P-TEMA R

Heat Exchanger designed with B-Jac Software (Teams/ Hetran)
Heat Exchanger is ASME Code Stamped
ASME Sec. VIII, Div. 1, ED. 2007

KEC Job Number: ES-392
Purchase Order Number: 070035-2800-229-001

NAME PLATE INFORMATION

Shell Side

MAWP:	38/1.05	Kgf/cm ²	@	149	°C
MDMT:	-29	°C	@	38	Kgf/cm ²

Tube Side

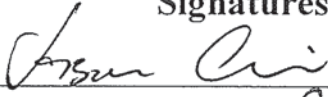
MAWP:	29.2/1.05	Kgf/cm ²	@	149	°C
MDMT:	-29	°C	@	29.2	Kgf/cm ²

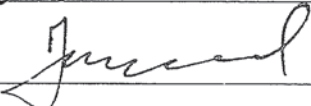
Serial Number: 08200, 08205, 08210
National Board Number: 1674, 1679, 1684
Year Built: 2009
Radiography: RT 4
Post Weld Heat Treat: None
Construction Type: W

Notes

Heat Exchanger Tag Number(s): 42E95, 43E95, 44E98
REV. 1

Signatures

Heat Exchanger Engineer:  Date: 11 / 11 / 09

Senior Heat Exchanger Engineer:  Date: 11 / 11 / 09

HEAT EXCHANGER SPECIFICATION SHEET

1	KEC Job Number: ES-392A				Date: 4/29/09			
2	P.O. No.: 070035-2800-229-001				Revision: 1			
3	Client: MTR				Service of Unit: INRU Comp. Lube Oil Cooler			
4	Location: Al-Jubail, Saudi Arabia				KEC'S S/N: 08200, 08205			
5	Client's Ref. No:				Tag Number: 42E95, 43E95			
6	Size	18 - 192in	Type	BEU	hor Connected in	1parallel	1series	
7	Surf/unit(eff.)	212.8 m ²	Shells/unit	1	Surf/shell (eff.)	212.8	m ²	
8	PERFORMANCE OF ONE UNIT							
9	Fluid allocation		Shell Side		Tube Side			
10	Fluid name		EL-4600-220		Water			
11	Fluid quantity, Total		kg/h		30629			
12	Vapor (In/Out)		kg/h					
13	Liquid		kg/h		30629 30629 93918 93918			
14	Noncondensable		kg/h					
15								
16	Temperature (In/Out)		C		92.5 48.89 37 44.44			
17	Dew / Bubble point		C					
18	Density		kg/m ³		805.25 823.35 995.41 992.79			
19	Viscosity		cp		24.84 123.02 0.6916 0.6041			
20	Molecular wt, Vap							
21	Molecular wt, NC							
22	Specific heat		kcal/(kg*C)		0.539 0.508 1.0003 1			
23	Thermal conductivity		kcal/(h*m*C)		0.134 0.137 0.53 0.538			
24	Latent heat		kcal/kg					
25	Pressure		kgf/cm ²		32.7 6.633			
26	Velocity		m/s		0.23 1.67			
27	Pressure drop, allow./calc.		kgf/cm ²		0.703 0.571 0.703 0.404			
28	Fouling resist. (min)		m ² *h*C/kcal		0.0002 0.0002			
29	Heat exchanged		699255 kcal/h		MTD corrected		23.38 C	
30	Transfer rate, Service		140.5 Dirty 158.9		Clean		190.3 kcal/(m ² *h*C)	
31	CONSTRUCTION OF ONE SHELL							
32			Shell Side		Tube Side		Sketch	
33	Design/Test pressure		kgf/cm ²		38 / 49.4 29.2 / 38			
34	Design temperature		C		-29 / 149 -29 / 149			
35	Number passes per shell				1 2			
36	Corrosion allowance		mm		3.18 3.18			
37	Connections		In		4 / 300 RFWN 6 / 300 RFWN			
38	Size/rating		Out		4 / 300 RFWN 6 / 300 RFWN			
39	in		Intermediate					
40	Tube No.	145Us	OD	19.05	Tks-min	2.11	mm	
41	Tube type	Wolverine 19/in (748/m)			Material	SA-179 K01200		
42	Shell	SA-106 B	ID	OD	508	mm	Shell cover	
43	Channel or bonnet	SA-106 B			Channel cover	SA-516 70		
44	Tubesheet-stationary	SA-516 70N			Tubesheet-floating			
45	Floating head cover			Impingement protection			None	
46	Baffle-crossing	SA-36 K02600	Type	single seg	Cut(%d)	26	hor	
47	Baffle-long	Seal type			Spacing: c/c 190.5 mm			
48	Supports-tube	U-bend			Inlet mm			
49	Bypass seal	Tube-tubesheet joint			Type			
50	Expansion joint	Type			dbl. grv./exp./str. wld			
51	RhoV2-Inlet nozzle	1369	Bundle entrance	994	Bundle exit	239	kg/(m*s ²)	
52	Gaskets - Shell side	Spiral-Wound Metal			Tube Side	Spiral-Wound Metal		
53	Floating head							
54	Code requirements	ASME Code Sec VIII Div 1 Ed. 2007			TEMA class	R		
55	Weight/Shell	3311	Filled with water	4218	Bundle	1678	kg	
56	Remarks Excess Area: 26%							
57	Water Flow Rate: 1,575 Lpm							

HEAT EXCHANGER SPECIFICATION SHEET

1	KEC Job Number: ES-392B				Date: 4/29/09			
2	P.O. No.: 070035-2800-229-001				Revision: 1			
3	Client: MTR				Service of Unit: PRNU Comp. Lube Oil Cooler			
4	Location: Al-Jubail, Saudi Arabia				KEC'S S/N: 08210			
5	Client's Ref. No:				Tag Number: 42E98			
6	Size	18 - 192in	Type	BEU	hor Connected in	1parallel1	series	
7	Surf/unit (eff.)	213 m ²	Shells/unit	1	Surf/shell (eff.)	213	m ²	
8	PERFORMANCE OF ONE UNIT							
9	Fluid allocation		Shell Side		Tube Side			
10	Fluid name		EL-4600-220		Water			
11	Fluid quantity, Total		kg/h 29691		92868			
12	Vapor (In/Out)		kg/h					
13	Liquid		kg/h 29691		29691		92868 92868	
14	Noncondensable		kg/h					
15								
16	Temperature (In/Out)		C 93.33		48.89		37 44.44	
17	Dew / Bubble point		C					
18	Density		kg/m ³ 804.93		823.35		995.41 992.79	
19	Viscosity		cp 24.18		123.02		0.6916 0.6041	
20	Molecular wt, Vap							
21	Molecular wt, NC							
22	Specific heat		kcal/(kg°C) 0.54		0.508		1.0003 1	
23	Thermal conductivity		kcal/(h*m°C) 0.134		0.137		0.53 0.538	
24	Latent heat		kcal/kg					
25	Pressure		kgf/cm ² 32.693				6.633	
26	Velocity		m/s 0.23				1.65	
27	Pressure drop, allow./calc.		kgf/cm ² 0.703		0.54		0.703 0.396	
28	Fouling resist. (min)		m ² *h°C/kcal 0.0002				0.0002	
29	Heat exchanged		691439 kcal/h		MTD corrected		23.63 C	
30	Transfer rate, Service		137.4 Dirty 156.5		Clean		186.6 kcal/(m ² *h°C)	
31	CONSTRUCTION OF ONE SHELL						Sketch	
32			Shell Side		Tube Side			
33	Design/Test pressure		kgf/cm ² 38 / 49.4		29.2 / 38			
34	Design temperature		C -29 / 149		-29 / 149			
35	Number passes per shell		1		2			
36	Corrosion allowance		mm 3.18		3.18			
37	Connections		In 4 / 300 RFWN		6 / 300 RFWN			
38	Size/rating		Out 4 / 300 RFWN		6 / 300 RFWN			
39	in		Intermediate					
40	Tube No. 145Us	OD	19.05	Tks-min	2.11	mm	Length 4877mm Pitch 23.81 mm	
41	Tube type	Wolverine 19/in (748/m)		Material	SA-179 K01200		Tube pattern 30	
42	Shell	SA-106 B	ID	OD	508	mm	Shell cover SA-516 70	
43	Channel or bonnet	SA-106 B		Channel cover	SA-516 70			
44	Tubesheet-stationary	SA-516 70N		Tubesheet-floating				
45	Floating head cover			Impingement protection	None			
46	Baffle-crossing	SA-36 K02600	Type	single seg	Cut(%d)	26	hor Spacing: c/c 184.15 mm	
47	Baffle-long			Seal type	Inlet mm			
48	Supports-tube			U-bend	Type			
49	Bypass seal			Tube-tubesheet joint	dbl. grv./exp./str. wld			
50	Expansion joint			Type				
51	RhoV2-Inlet nozzle	1287	Bundle entrance	458	Bundle exit	155	kg/(m ² *s ²)	
52	Gaskets - Shell side	Spiral-Wound Metal		Tube Side	Spiral-Wound Metal			
53	Floating head							
54	Code requirements	ASME Code Sec VIII Div 1 Ed. 2007			TEMA class	R		
55	Weight/Shell	3311	Filled with water	4218	Bundle 1678	kg		
56	Remarks	Excess Area: 26%						
57	Water Flow Rate: 1,556 Lpm							